BPMpro Data Logger User Guide v3

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Contents

BPMpro Data Logger

- BPMpro Data Logger software
- BPMpro Body Data Analyser software
- 1 BPMpro sensor
- 1 extra small (30cm) strap, which can be joined to
- 1 small (44cm) strap
- 1 sensor belt loop
- Sensor mains charger
- USB Bluetooth dongle
- Quick Start user guide

System Requirements

The BPMpro Data Logger works on any Windows-based tablet or PC, but has been designed specifically for devices running Windows 7 or 8 to benefit from its touch-screen capabilities.

Warranty

All BPMpro products come with a 12 month warranty as standard. For the warranty to apply, the product must be registered on the BPMpro website:

www.bpmpro.co.uk/contact-us/product-registration/

Contact Details

If you have any problems using the BPMpro Data Logger or Body Data Analyser, please contact us:

Tel: +44 (0)1264 861375

Email: support**@bpmpro.co.uk**

or visit the **BPMpro** website: **www.bpmpro.co.uk**

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Getting Started

Loading the software

- Download the Data Logger installer file as directed when purchased
- Find the BPMpro Data Logger installer file on the desktop (icon shown right) and run
- Follow the screen prompts and run the BPMpro Data Logger application if it does not auto-start
- The first time the software is used, a licence key must be entered to connect the sensor (s) to the software
- A licence key is obtained by going to **www.bpmpro.co.uk/contact-us/product-registration/** to register the BPMpro sensor(s) and entering the software voucher code
- The following input screen will appear:

- The simplest way to enter the licence key is to paste it from the clipboard
- It is now possible to connect the sensor(s)
- To enter a licence code, at a later stage, press the 'Home' key on the key board.

Charging the sensor

- Remove the plug from the top of the sensor
- To charge the sensor use the mains charger
- A slow-flashing LED indicates that the sensor is now charging
- A sensor will require around 1 hour to charge fully
- Once fully charged put the plug back in the top of the sensor as without the plug in place, the push button will not trigger the software
- When charging from discharged the sensor is initially sent into a sleep state
- The LED will flash rapidly to show the sensor is in the discharged state
- The sensor will remain in this state for a few minutes during which it will not connect

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Putting a sensor into Find mode

- A sensor must be charged and in Find mode to be able to connect, this is done by:
  - Pressing the middle of the sensor twice,
  - Shaking the sensor, or
  - Plugging in a charger lead

- In Find mode the top blue LED will flash
- A sensor will return to Standby mode if unconnected for around 5 minutes
- A sensor can remain in Standby mode for around 8 days before the battery is discharged

Connecting a sensor to the Data Logger software

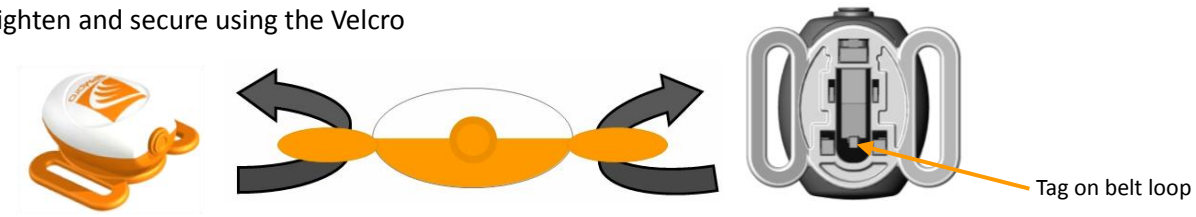
- With the software running and the sensor in Find mode, press or click one of the Euler balls
- A warning message will appear if Bluetooth is not enabled - if this is the case, quit the application and enable Bluetooth on the computer

- 'Press to connect' and a green arrow will appear next to unconnected sensors
- If the sensor fails to connect, click on another Euler ball and repeat if necessary
- Progress is shown by the wording 'Connecting' flashing in the time box
- Sensor connection can take up to 20 seconds

- Repeat for second and third sensors if required
- Once connected the Euler ball follows rotation of the sensor and the battery level is shown

Attaching a sensor

- The strap is inserted through the belt loop as shown with the Velcro side against the body and the smooth neoprene side with the BPMpro label uppermost
- Tighten and secure using the Velcro



- To remove the belt loop, gently lift the tag on the reverse of the belt loop and slide off the sensor
- For body analysis, the sensor should be attached to the outside of the limb with the plug uppermost

Two further methods of attaching the sensor are available: Padplates, which are designed to mount the sensor directly onto the body using disposable double-sided medical tape disks, and cuffs, which are designed as a quick way of mounting the sensor on the arm or leg.

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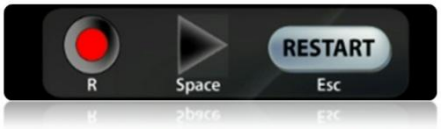
Sensor modes

Sensor modes	Sensor Indication	
Flat	**None**	• The sensor battery is flat • The sensor cannot be connected until charged
Standby	**None**	• After around 5 minutes of inactivity the sensor enters Standby • A sensor will hold its charge for around 7 days in Standby mode
Charging	**A single, slow-flashing LED** **A single, fast-flashing LED**	• To charge the sensor use the mains charger • The slow-flashing LED indicates that the sensor is now charging and in Find mode • If the battery is flat when the charger is connected: – The LED near the charge socket may flash rapidly – The sensor will not go into Find mode immediately – After around 3 minutes the LED will flash more slowly – The sensor is now in Find mode • A sensor can be used for tests while charging • A sensor will require around 1 hour to charge fully
Find	**Two flashing LEDs**	• A sensor is put into Find mode by: – Pressing the middle of the sensor twice, – Shaking the sensor, or – Plugging in a charger lead (this will result in only one flashing LED) • A sensor remains in Find mode until: – Connected to the software, or – It is left unconnected for around 5 minutes
Connected	**None**	• When the sensor is moved the Euler ball (sphere) will move • A fully-charged sensor provides c. 8 hours of continuous use

Control buttons

Note: Using the keyboard commands affects all connected sensors at the same time. To control each sensor/display separately, use the on-screen icons below:



The table below explains the purpose of each button and key:

● **(R)**	Starts the timer and the recording of a session. Repeated pressing of R starts and stops the recording of events within the session. This eliminates the recording of any unwanted data.
Play (Space)	Starts the timer without starting the recording
Restart (Esc)	Stops a session and resets the timer
S key	Toggles the scale on the graph between 2G and 10G
A key	Switches between Continuous and Maximum modes
Z key	Zeroes the Euler angles

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BPMpro Data Logger Display

1. The graph shows peak acceleration and peak rotation against time. The two vertical bars display the current maximum figures on the graph. Press the S key to toggle the scale.

2. This section displays an Euler image of the BPMpro sensor. The associated Euler angles are displayed in either continuous or maximum mode using the A (mode) key. The angles are reset using the Z (zero) key on the keyboard.

3. TIME is a time counter of a running session and reset using the escape key which also ends the session.

4. REPS is the number of events that have exceeded the target settings (work or activity cycles such as number of jumps or leg lifts) carried out within the session. Pressing 1, 2, 3 or 9 (all sensors) inserts a # into the rep field as a time stamp for alignment with video recordings.

5. A target trigger point is set by sliding the triangle along the bargraph. When exceeded, the bar turns red, a beep sounds and the peak figure is displayed in the box under the bargraph on the left.

6. JUMP or peak height change: this is the measurement of the height change of a sensor from a stationary position held for c.3 seconds to its maximum displacement.

7. COMPRESSION is the force applied to the sensor or to an external airbag (which would need additional calibration).

8. POWER is the instantaneous power driven by the weight setting and total acceleration figures.

9. The SUBJECT WEIGHT and SUBJECT HEIGHT figures belong to the object under test such as a weight stack, rep, distance or person.

10. SESSION is the name of the session or person under test and is inserted into the filename for ease of identification of the file at a later date.

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BPMpro Body Data Analyser

The BPMpro Body Data Analyser has been created using Excel, Visual Basic and macro tools to help users in interpreting the extensive data output from the BPMpro Data Logger specifically when measuring the body by organising and displaying the data quickly and easily. By using Excel, it also means that the user can understand how to load up specific BPMpro Data if they wish to build their own data analysis spreadsheets.

The BPMpro Data Logger is a powerful movement data collection tool, but the range of parameters produced by the Data Logger can be confusing if the user does not fully understand the advanced mathematics, movement and motion analysis being presented. Quite often, however, it is not the actual data, but the trends and differences between the data that are more important.

The Analyser allows the user to quickly and easily select different data files, different parameters from those files and to compare the results against files from different sources or from different points in time. On the Chart Display tab there are two displays so that data with different vertical scales can be displayed at the same time. The dual graphs also allow you to view completely different data at the same time and to view differential data where one set of data is added or subtracted from the other.

For example, the data from one athlete can be quickly compared to that of another and different aspects of their motion subsequently studied in further detail so that the coach can understand from where differences in performance are derived.

The Body Data Analyser has a number of powerful features to enable body data analysis when a BPMpro sensor is aligned vertically on the body:

- **Zoom In/Out** - the Analyser has been designed to make it simple to zoom in on data points, either in 5 second steps or by zooming straight into a one second view in the middle of the timeline. Similarly the Zoom Out function allows the user to zoom out in either 5 second steps or straight back to the full view.
- **Movable Timeline** - the period of time displayed can be moved backwards and forwards either in one second blocks or to the start or end of the timeline whilst retaining the applied level of zoom.
- **Statistical data -** the Large Chart screen also shows statistical information on what is displayed: range, average, mean, maximum, minimum and frequency.
- **Data Playback** – the displayed data can replayed in full screen so that the user can see how the selected parameters interact in real time.
- **Data Alignment** - the Offset feature enables you to zero the starting points of each parameter to make analysis easier.
- **Data Conversion** – when the Analyser reads in data files, some automated data conversion takes place to make certain data parameters easier to work with. For example, the orientation data output from the Data Logger is changed from vector units into degrees which are more widely understood.
- **Data Calculation** - when data files are read in, the Analyser additionally calculates extra parameters such as continuous angles for x, y and z axis movements.
- **Differential Analysis** - the Function feature enables the user to quickly carry out subtraction and addition functions to highlight the difference between different sets of data.

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Data Analyser Display

The Body Data Analyser workbook has a number of tabs that contain the source data from the selected files as well as a number of screens, but all the data import and display selection is driven by the Chart Display screen shown below.

The different areas of the screen are as follows:

1. Title Field

The titles for the graphs are entered into these fields.

2. View Large Button

Pressing this button takes the user to the 'Large Chart' tab where the graph is shown full screen.

3. Refresh Button

The Refresh button is used to reset the graphical display(s) to reflect the selected channel data if this does not happen automatically or if there is a problem with the macros or visual basic commands.

4. Control Buttons

See section below.

5. Import Data Buttons

These buttons are used to import the data files produced by the BPMpro Data Logger for use by the Analyser. The name of the imported file is shown in the white box underneath each button to make it easier to select the data source.

There are 3 Import Data buttons as the BPMpro Data Logger supports the connection of 3 sensors. It is, however, possible to import 3 different data files all from the same sensor if you wish to compare different data sessions.

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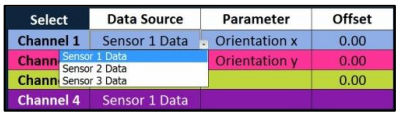
The name on each button is determined by the names of the three tabs, initially labelled Sensor 1 Data, Sensor 2 Data and Sensor 3 Data. These tabs and consequently the Import Data buttons can be renamed for ease of use. For example, the tabs could be renamed to reflect scenarios such as:

- Tuesday Data, Wednesday Data, Thursday Data
- Wrist Data, Lower Arm Data, Upper Arm data

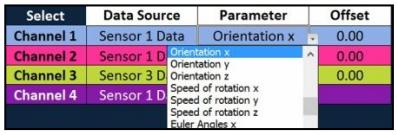
Note: The new tab name must still include the word 'data' for button name and data source reference to change.

6. Data Source



- To change the source from which the charts display data, click on the Channel/Data Source box to be changed and a down arrow will appear
- Click on this down arrow to see the data sources available. This enables the user to mix and match data that has previously been loaded. Up to 4 channels (lines per graph) can be selected to be displayed on either graph.

7. Parameter



- Select the parameters to be displayed from the dropdown lists. Any one of the defined parameters can be selected per channel.
- 'Logo tilt' and 'Logo rock' are specific sensor parameters covering angles when the sensor logo is tilted forwards/backwards or rocked left/right. If the parameter you require is not listed, please contact **support@bpmpro.co.uk**.

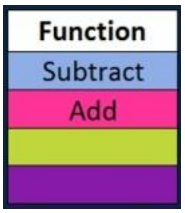
8. Offset

The starting point of any selected parameter can be offset by a number to effectively zero the starting result. This is useful when looking to compare negative and positive angles.

- Type in a positive or negative Offset such as degrees or g against the parameter you want to move on the display. This offset is also taken into account if a function is selected.

9. Function

In order to visualise the difference between data from two different sources, the Function feature enables the selected channel data to be added or subtracted.



For example, should Logo rock on the left graph be subtracted from Logo rock on the right graph, the difference would be displayed on the right hand graph.

This is particularly useful when comparing angles such as for dynamic knee bend or comparing the difference between the acceleration of different athletes or legs.

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Other Tabs

The Data Analyser workbook contains several tabs that appear along the bottom of the screen. The Chart Display tab is the main tab, with the purpose of the others being as follows:

1. Large Chart

When 'View Large' is pressed, the user is taken to this tab where the selected data is displayed in full screen. This screen also shows statistical information on what is displayed: range, average, mean, maximum, minimum and frequency. Press 'Return to Main' to return to the Chart Display tab.

2. Play

When the Playback button is pressed, the user is taken to this tab where the selected data is run through in sequence. Press 'Return to Main' to return to the Chart Display tab.

3. Control Buttons

This tab lists out all of the icons/buttons and their functions.

4. Parameter Information

This lists out all of the parameters that have been read in from the BPMpro sensors, their units of measurement and other relevant information.

5. Sensor 1 Data, Sensor 2 Data, Sensor 3 Data

These are the data tabs into which the data files are loaded when the 'Import Data' buttons are pressed.

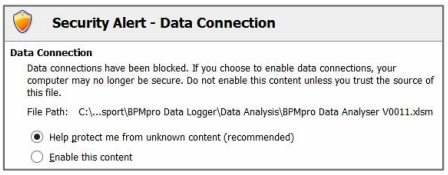
6. VB set up

Note: This is a system tab which must not be altered in any way. If you require different parameters to be listed, please contact support@bpmpro.co.uk.

Importing Data

When loading up the Analyser, ensure that content is enabled if the warning box shown below appears.

Session data is automatically saved by the BPMpro Data Logger to Documents\BPMsport data. It is saved in a comma delimited file under the name of the **SESSION NAME-SESSION ID-TIME-DATE**. This format makes it easy to identify the correct file to load up.


Security Alert - Data Connection
Data Connection
Data connections have been blocked. If you choose to enable data connections, your computer may no longer be secure. Do not enable this content unless you trust the source of this file.
File Path: C:\...sport\BPMpro Data Logger\Data Analysis\BPMpro Data Analyser V0011.xlsm
Help protect me from unknown content (recommended)
Enable this content

The required data is imported by pressing one of the 'Import Sensor Data' buttons. This takes the user to the standard BPMpro Data storage location and displays the list of available files/sessions.

If the BPMpro data files have been imported manually, ensure that the data is stored in a folder called 'BPMsport Data' under C:Documents, or the Analyser will report a 'Run time error 76, Path not found'.

- Should this error occur, select the correct data path, load in the data files and then re-select the data import button
- Once the data files have been found, select the required file and press Open

The name of the selected file appears underneath the Data Import in the Chart Display.

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Control Buttons

The control buttons under the graphs perform the following tasks:

Icon	Action
	Moves the displayed data to the start of the data file at the selected zoom
	Moves the displayed data to the left in one second blocks, but retains the level of zoom that has been applied
	Zooms in on the displayed data in 5 second steps
	Zooms in to a one second view in the middle of the timeline
	Zooms out to display the full timeline
	Zooms out in 5 second steps
	Moves the displayed data to the right in one second blocks, but retains the level of zoom
	Moves the displayed data to the end of the data file at the selected zoom
	Prints the selected graph (as displayed on the Large Chart) to the default printer
	Displays the data on the 'Play' tab and runs through the selected data in sequence
	Updates the graph(s) display to reflect changes made to the parameter settings
	Displays the selected graph and its data on the 'Large Chart' tab
	Returns the user to the 'Chart Display' tab
	Stops playback of the data on the 'Play' tab

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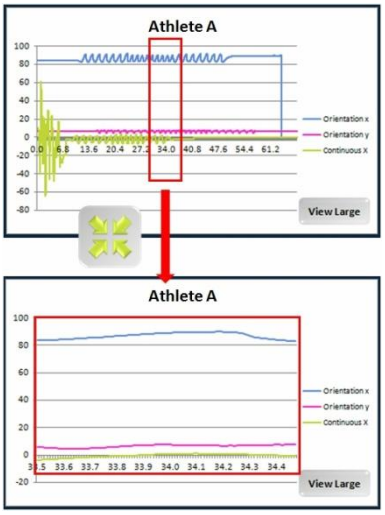
Control Buttons - Examples

Once the selected file data has been imported and the data for the different channels selected, the Control Buttons keys can be used to zoom in/out on the data as well as to move the selected display to the left and right.



Example 1

In this example, the initial data selection has 3 channels, indicated by 3 lines on the graph, and a timeframe of 61.2 seconds, shown on the x (horizontal) axis.

To zoom into a particular point, press the 'Zoom In' button and the display zooms into a 1 second view at the middle of the data timeline.

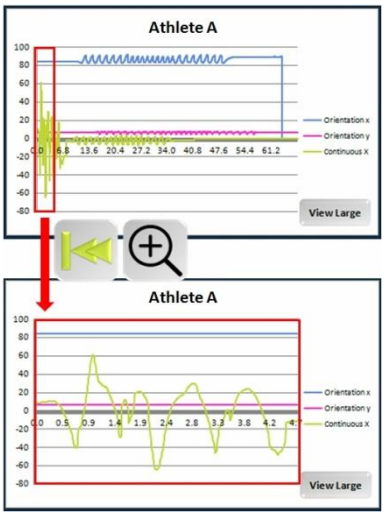
The 'View Large' button takes the user to the Large Chart tab which shows a full screen image of the selected data and zoom level as shown on the graphs on the main display.

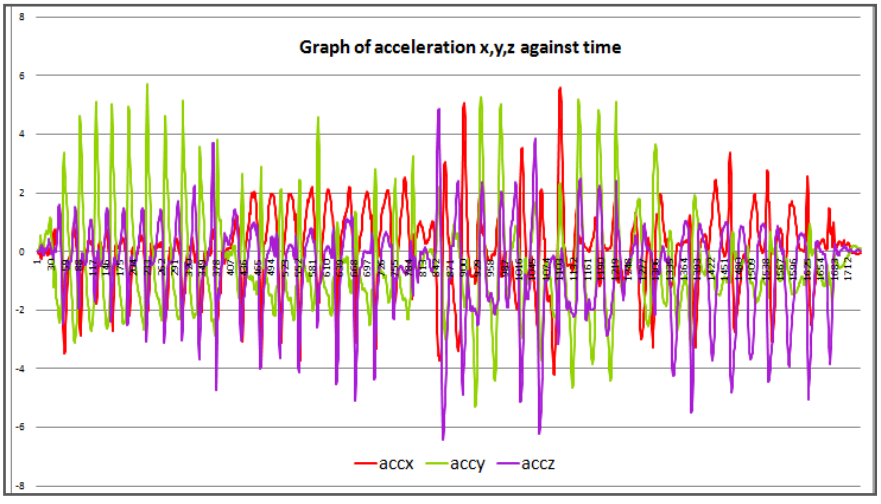
Example 2

The Control Buttons can be used to zoom in or out of the display and to move the visual display of the data to the left or right.

In this second example, to review the data at the start of the recording with a increased level of zoom, press the back to the start and the zoom buttons.

The 'Play' button takes the user to the 'Play' tab which shows a full screen playback of the selected data in the timeframe and at the zoom level selected as shown on the graph on the Chart Display.





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Appendix 1 - Sensor Calibration

All BPMpro sensors are individually calibrated prior to shipment. It is, however, recommended to recalibrate the sensors on a regular basis. Calibration software is included as standard with the Data Logger.

Set up & ID code identification

- Activate the sensor(s) to calibrate or identify
- Run the calibrator
- Press or click on the 'FIND AND CONNECT' (ETSI UUSIA JA KYTKE) button. Note: This might be in Finnish depending on your set up.

The calibrator will indicate the sensor(s) it has found.

- If it fails to find any sensors, press the 'BACK' (TAKAISIN ALKUUN) button and repeat the connect process
- Press the F3 key and the sensor ID code will appear underneath the 'CONNECT' button (KYTKE)
- Press the 'CONNECT' button (KYTKE) to connect the sensor

Confirm the sensor is connected by moving and/or squeezing it. The sphere on the screen will move and change as it is moved and squeezed and the mBar reading in the bottom LHS of the screen will also change.

The blue bar under the sphere indicates the amount of sensor battery power remaining.

Calibration

- To calibrate, press the 1 key and rotate/roll the sensor around in your hands until at least the number 3 or higher appears above the BACK (TAKAISIN ALKUUN) button

Four lines will run across the screen: Black (magnetic line) and green, red and blue (x, y, and z). Watch the black line as you rotate the sensor - this line should be as flat as possible

- If no lines appear, press F3 and the 1 key again
- Press the Ins key on your keyboard to upload the new calibration setting into the sensor
- Repeat the process of pressing the 1 key 3-5 times, rotating the sensor in your hands, waiting until the number 3-6 appears above the BACK (TAKAISIN ALKUUN) button
- Once this is achieved, press the Ins key
- When you are comfortable the black line is as flat as you can get it, press either the x to the top right of the sensor to disconnect it and repeat the process above, or exit the application.

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Appendix 2 - Biomaster® Antimicrobial Technology

BPMpro sensors containing Biomaster were tested in accordance with ISO 22196:2011:

Biomaster
PROTECTED
This product is treated with Biomaster silver biocide tested to ISO 22196:2011
Please use biocides responsibly

- To determine anti-microbial efficacy the samples were tested along with a lab control sample
- The sensors were challenged against stock cultures of S. aureus (MRSA) and E.coli
- The samples were inoculated using a known amount of the above cultures and incubated for 24 hours at 37°C
- The Total Viable Count (TVC) of bacteria were then recorded and the percentage reduction calculated
- The sensors were awarded certificate **#1021642.225/7681**
- The table shows the results recorded by Industrial Microbiological Services Ltd. for the BPMpro sensors:

Bacteria 0 hours		Bacteria 24 hours		% reduction	
S.aureus	E.coli	S.aureus	E.coli	S.aureus	E.coli
1.80E+04	1.60E+04	1.70E+02	5.20E+01	≥99.02%	≥99.67%

Bacteria 0hrs - CFU of bacteria at 0 hours of testing, Bacteria 24hrs - CFU of bacteria at 24 hours of testing, % reduction - % level of reduction in bacteria, CFU - colony forming units

Disposal of BPMpro sensors (WEEE Directive 2002/96/EC)

At the end of its serviceable life the BPMpro sensor should not be treated as household waste. The sensor should be returned to the supplier for suitable disposal or handed over to a suitable recycling facility for electrical and electronic equipment.

EC Declaration of Conformity

CE

Product:	**BPMpro Data Logger**
Manufacturer:	270 Vision Limited
Company number:	7505941
Registered office:	Suite 47, Basepoint Business Centre, Winnall Valley Road, Winchester, SO23 0LD, UK

As the manufacturer of the BPMpro Data Logger, we, 270 Vision Limited, declare that the product and its component subassemblies comply with the applicable EU directives and appropriate standards:

- Applicable EU Directives: Directive 1999/5/EC on Radio and Telecommunications Terminals
- Appropriate Standards: ETSI EN 300 328 V1.1.1:2006 Wide Band Data Transmission Equipment

Signed: Martin Gossling

Name: Martin Gossling
Position: Director
Date: 1st June 2013

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